



Greggs Bakery / Twickenham

SAP 10 Calculation Report Apartment

January 2023 Revision 01

Predicted Energy Assessment



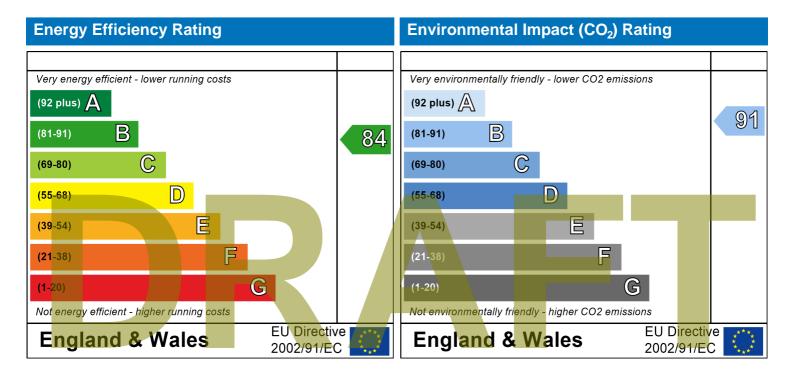
Twickenham London Square London

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Top floor Flat 05 December 2018 Stroma Certification

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			on: 1.0.5.57	
A 11		Property		: Greg B	akery F	05 top Fl	loor		
Address: 1. Overall dwelling dimer	Twickenham London Squa	re, Lonac	on						
1. Overall awelling aimer	Tolorio.	Are	a(m²)		Av. He	ight(m)		Volume(m³))
Ground floor			<u> </u>	(1a) x		2.5	(2a) =	177.5	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	71	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	177.5	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	r
Number of chimneys		+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	ns			Γ	0	x	10 =	0	(7a)
Number of passive vents				Ī	0	x .	10 =	0	(7b)
Number of flueless gas fir	res			Ī	0	X 4	40 =	0	(7c)
				\ _			Air ch	nanges per ho	ur
	s, flues and fans = (6a)+(6b)+			a antinu a fr	0		÷ (5) =	0	(8)
Number of storeys in th	een ca <mark>rried o</mark> ut or is intended, proce ee dwelling (ns)	ea 10 (17), 1	ourierwise (conunue ir	OIII (9) 10 ((16)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pro deducting areas of openin	esent, use the value corresponding	to the great	ter wall are	a (after					
,	oor, enter 0.2 (unsealed) or (0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	! x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
,	q50, expressed in cubic metr		•	•	etre of e	envelope	area	3	(17)
•	ty value, then $(18) = [(17) \div 20] +$							0.15	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has been do	one or a de	gree air pe	rmeability	is being u	sed			7(40)
Shelter factor	u		(20) = 1 -	[0.075 x (1	19)] =			0	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified for	_							00	` ′
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22									
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
			-	L				I	

Adjusted infiltrat	ion rate	allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effecti		-	rate for t	he appli	cable ca	ise	•	•	•	•	•	•	(oo)
If exhaust air hea			andiv N (2	3h) - (23s	a) v Emy (4	aguation (N5N othe	rwisa (23h) – (23a)			0.5	(23a)
If balanced with h		•	•	, ,	,	•		,) = (20a)			0.5	(23b)
a) If balanced		-	-	_					2h)m + (23h) 🗴 [1	1 <i>– (23c</i>)	77.35 1001	(23c)
(24a)m= 0.3	0.3	0.3	0.28	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.29]	(24a)
b) If balanced	mecha	nical ve	entilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (23b)		<u>l</u>	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole hou	use ext	ract ver	ntilation o	or positiv	e input	ventilatio	on from o	outside	•	•	•	•	
if (22b)m -	< 0.5 ×	(23b), t	then (24d	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b) '	ı	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ve if (22b)m :									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air cl	hange r	ate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.3	0.3	0.3	0.28	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.29		(25)
3. Heat losses	and hea	at loss i	paramete	er:								_	
ELEMENT	Gross area (Openin		Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
Doo <mark>rs</mark>										/			
					2.1	X	1.3	=	2.73				(26)
Windows Type 1	1				2.1		1.3 /[1/(1.3)+		2.73	R			(26) (27)
Windows Type 1 Windows Type 2						x1		0.04] =					
	2				2.36	x1	/[1/(1.3)+	0.04] =	2.92				(27)
Windows Type 2	2				2.36	x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+	0.04] = [0.04] = [0.04] =	2.92				(27) (27)
Windows Type 2 Windows Type 3	2 3 4				2.36 2.36 1.85	x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = $\begin{bmatrix} 0.04 \end{bmatrix}$	2.92 2.92 2.29				(27) (27) (27)
Windows Type 2 Windows Type 3 Windows Type 4	2 3 4 5				2.36 2.36 1.85 2.36	x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92				(27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 5	2 3 4 5	6	10.1	7	2.36 2.36 1.85 2.36 2.36	x1 x1 x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92				(27) (27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6	2 3 4 5 5 6 6	_	10.1	=	2.36 2.36 1.85 2.36 2.36 3.6	x1 x1 x1 x1 x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92 4.45				(27) (27) (27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type 1	2 3 4 5 5 27.36			=	2.36 2.36 2.36 2.36 3.6	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 1.85 2.36 2.36 3.6 17.19	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29) (29)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29) (29) (30)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1 24.88	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 1.85 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32)
Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 2.36	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1 24.88 18 71 25.49	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c)
Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall ** Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88 71 25.49 22.19	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c) (32c)
Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall ** Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88 71 25.49 22.19 23.75	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c) (32c) (32c)

											_			_
Interna						71					L			(32d)
					indow U-va Is and part					e)+0.04] a	is given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				40.96	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17525.78	(34)
Therm	al mass	parame	ter (TMF	⊃ = Cm -	: TFA) in	ı kJ/m²K			Indica	tive Value	Medium		250	(35)
	•		ere the de tailed calc		constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
					using Ap	nendix k	<						3.69	(36)
	ŭ	`	,		= 0.05 x (3	•	`						3.09	(00)
	abric he			, ,	,	,			(33) +	(36) =			44.64	(37)
Ventila	tion hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)	•		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.84	17.62	17.4	16.3	16.08	14.98	14.98	14.76	15.42	16.08	16.52	16.96		(38)
Heat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	62.48	62.26	62.04	60.94	60.72	59.62	59.62	59.4	60.06	60.72	61.16	61.6		
Heat Ic	ss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	60.89	(39)
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
									,	Average =	Sum(40) _{1.}	12 /12=	0.86	(40)
Numbe	er of day	s in moi	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
				irement:						۰	2.	·	ear:	(42)
Assum if TF	ed occu A > 13.9	ipancy, l 9, N = 1	N		0(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (ΓFA -13.		kWh/ye	ear:	(42)
Assum if TF if TF	ed occu A > 13.9 A £ 13.9	ipancy, I 9, N = 1 9, N = 1	N + 1.76 x	ː [1 - exp	(-0.0003	·		, , -	•	ΓFA -13.	9)	27	ear:	
Assum if TF if TF Annua	ed occu A > 13.9 A £ 13.9 I averag	pancy, l 9, N = 1 9, N = 1 e hot wa	N + 1.76 x ater usag	ː [1 - exp		y Vd,av	erage =	(25 x N)	+ 36		9) 88	·	ear:	(42)
Assum if TF if TF Annua Reduce	ed occu A > 13.9 A £ 13.9 I averag the annua	ipancy, l 9, N = 1 9, N = 1 e hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by	e(-0.0003 es per da	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9) 88	27	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa la average litres per l	N + 1.76 x ater usag hot water person per Mar	ge in litre usage by r day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36		9) 88	27	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa la average litres per l	N + 1.76 x ater usaç hot water person per Mar	ge in litre usage by r day (all w	es per da 5% if the d	ay Vd,av welling is not and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 88	.12	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa la average litres per l	N + 1.76 x ater usaç hot water person per Mar	ge in litre usage by r day (all w	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 88	.12	ear:	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan er usage ii	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 82.83	ay Vd,av welling is not and co Jun ctor from 7	erage = designed id) Jul Table 1c x 79.3	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35	Oct 89.88 Fotal = Su	9) 88 Nov 93.4 m(44) ₁₁₂ =	.12 Dec	1057.39	
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 96.93	pancy, I 9, N = 1 9, N = 1 e hot wa al average litres per I Feb n litres per 93.4	N + 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by r day (all w Apr ach month 86.35	es per da 5% if the day water use, If May $Vd,m = fac$ 82.83	ay Vd,av lwelling is not and co Jun ctor from 7 79.3	erage = designed and designed a	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35	Oct 89.88 Fotal = Su th (see Ta	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1	27 .12 .12 .12 .96.93		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan er usage ii	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac 82.83	ay Vd,av welling is not and co Jun ctor from 7	erage = designed id) Jul Table 1c x 79.3	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35 6 kWh/mon 100.77	Oct 89.88 Fotal = Su th (see Ta	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19	27 .12 Dec 	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	ed occu A > 13.9 A £ 13.9 I averag the annual e that 125 Jan 96.93	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per p Feb n litres per 93.4 hot water	N + 1.76 x ater usage hot water person per Mar day for ear 89.88 used - cal	ge in litre usage by r day (all wash month 86.35	es per da 5% if the day water use, If May $Vd,m = fac$ 82.83	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r	erage = designed and ld) Jul Table 1c x 79.3 m x nm x E 86.78	(25 x N) to achieve Aug (43) 82.83 97m / 3600 99.58	+ 36 a water us Sep 86.35 6 kWh/more	Oct 89.88 Fotal = Su th (see Ta	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1	27 .12 Dec 		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m=	led occu A > 13.9 A £ 13.9 I average the annual ethat 125 Jan 96.93 content of 143.74	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per p Feb 1 litres per 93.4 hot water 125.72 vater heatii	N + 1.76 x ater usag hot water person per Mar day for ea 89.88 used - cal	ge in litre usage by r day (all wash month 86.35	es per da 5% if the dayater use, H May Vd,m = fac 82.83 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r	erage = designed and ld) Jul Table 1c x 79.3 m x nm x E 86.78	(25 x N) to achieve Aug (43) 82.83 97m / 3600 99.58	+ 36 a water us Sep 86.35 6 kWh/more	Oct 89.88 Fotal = Su th (see Ta	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19	27 .12 Dec 	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water	led occu A > 13.9 A £ 13.9 I average the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per I Feb n litres per 93.4 hot water 125.72 vater heatin 18.86 loss:	N + 1.76 x ater usag hot water person per Mar day for ea 89.88 used - cal 129.73 ng at point 19.46	ge in litre usage by r day (all was Apr ach month 86.35	es per da 5% if the da rater use, he May Vd,m = fact 82.83 conthly = 4. 108.52 co hot water 16.28	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65	erage = designed in did) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02	(25 x N) to achieve Aug (43) 82.83 07m / 3600 99.58 boxes (46) 14.94	+ 36 a water us Sep 86.35 0 kWh/mort 100.77 100.77 15.12	See target of Oct 89.88 Fotal = Surth (see Tail 117.44 Fotal = Surth 117.62	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 Dec 96.93 20.88	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag	ed occu A > 13.9 A £ 13.9 I average the annual enthat 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum	pancy, I P, N = 1 e hot wa al average litres per I Feb 1 litres per 93.4 hot water 125.72 rater heatil 18.86 loss: e (litres)	N + 1.76 x ater usage hot water person per Mar day for ear 89.88 used - cal 129.73 ng at point 19.46	ge in litre usage by r day (all wash month a6.35) Coulated month a13.1 tof use (not 16.97)	es per da 5% if the day ater use, H May Vd,m = fac 82.83	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 storage), 14.05	erage = designed and ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage	(25 x N) to achieve Aug (43) 82.83 97.m / 3600 99.58 boxes (46) 14.94 within sa	+ 36 a water us Sep 86.35 0 kWh/mort 100.77 100.77 15.12	See target of Oct 89.88 Fotal = Surth (see Tail 117.44 Fotal = Surth 117.62	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 .12 .96.93	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy ((45)m= If instant (46)m= Water Storag If comr	led occu A > 13.9 A £ 13.9 I average the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volumer	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per I Feb n litres per 93.4 hot water 125.72 vater heatin 18.86 loss: e (litres)	N + 1.76 x ater usage hot water person perso	ge in litre usage by r day (all was Apr ach month 86.35 culated me 113.1 tof use (no 16.97 ank in dw	es per da 5% if the da rater use, he May Vd,m = fact 82.83 conthly = 4. 108.52 co hot water 16.28	ay Vd,av Iwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 r storage), 14.05 /WHRS	erage = designed in designed i	(25 x N) to achieve Aug (43) 82.83 07m / 3600 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 0 kWh/mort 100.77 15.12 ame vess	See target of Oct 89.88 Fotal = Sunth (see Tail 117.44 Fotal = Sunth (see Tail 117.44)	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 Dec 96.93 20.88	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Water	ed occu A > 13.9 A £ 13.9 I average the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum munity he vise if no	pancy, I P, N = 1 P, N = 1 Pe hot wa al average litres per p Peb Politres per Pass Pass Pass Pass Pass Pass Pass Pas	N + 1.76 x ater usage hot water person per Mar reday for ear 89.88 used - cal 129.73 ng at point 19.46 includir and no tal hot water services and services are services as a services are services and no tal hot water services are service	ge in litre usage by r day (all was Apr ach month 86.35 deulated me 113.1 et of use (not ank in dwer (this in the ser (this i	es per da 5% if the day 5% if the day 70 May 70 Vd,m = factor 82.83 108.52 108.52 109 hot water 16.28 109 policies in the control of the control o	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 14.05 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 82.83 07m / 3600 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 0 kWh/mort 100.77 15.12 ame vess	See target of Oct 89.88 Fotal = Sunth (see Tail 117.44 Fotal = Sunth (see Tail 117.44)	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 Dec 96.93 20.88	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= Water Storag If commother Otherw Water a) If m	led occu A > 13.9 A £ 13.9 I average the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum munity he vise if no storage tanufact	pancy, I P, N = 1 P, N = 1 P hot wa al average litres per l P	N + 1.76 x ater usage hot water person per Mar reday for ear 89.88 used - cal 129.73 ng at point 19.46 includir and no tal hot water services and services are services as a services are services and no tal hot water services are service	ge in litre usage by r day (all was Apr ach month 86.35 deulated me 113.1 to of use (not ank in dwar (this in oss factors)	es per da 5% if the day tester use, if May Vd,m = fact 82.83 conthly = 4. 108.52 conthus to the control of the control	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 14.05 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 82.83 07m / 3600 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 0 kWh/mort 100.77 15.12 ame vess	See target of Oct 89.88 Fotal = Sunth (see Tail 117.44 Fotal = Sunth (see Tail 117.44)	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ = 19.23	27 .12 Dec 96.93 20.88	1057.39	(43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) =	0.72	(50)
b) If manufacturer's declared cylinder loss factor is not know	() ()	0.72	(00)
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3 Volume factor from Table 2a			(50)
Temperature factor from Table 2b		0	(52) (53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =		` '
Enter (50) or (54) in (55)	(47) x (31) x (32) x (33) =	0.72	(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	0.72	(00)
(56)m= 22.32 20.16 22.32 21.6 22.32 21.6 22.32	22.32 21.6 22.32	21.6 22.32	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷			l ix H
(57)m= 22.32 20.16 22.32 21.6 22.32 21.6 22.32	22.32 21.6 22.32	21.6 22.32	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss (alindar) from Table 3 Primary circuit loss calculated for each month (59) m = (58) ÷	365 × (41)m	Ü	(66)
(modified by factor from Table H5 if there is solar water hea	, ,	stat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	-1)m		•
(61)m= 0 0 0 0 0 0 0 0		0 0	(61)
Total heat required for water heating calculated for each mon	th (62)m = 0.85 × (45)m +	(46)m + (57)m +	(59)m + (61)m
(62)m= 189.32 166.89 175.31 157.21 154.11 137.76 132.3	i i	172.3 184.79	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar			
(add additional lines if FGHRS and/or WWHRS applies, see		,	
(63)m= 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater		-	
(64)m= 189.32 166.89 175.31 157.21 154.11 137.76 132.3	6 145.16 144.88 163.02	172.3 184.79	
	Output from water heate	r (annual) ₁₁₂	1923.11 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m]
(65)m= 84.26 74.74 79.6 72.9 72.55 66.43 65.32	69.58 68.79 75.51	77.91 82.75	(65)
include (57)m in calculation of (65)m only if cylinder is in th	e dwelling or hot water is fr	om community h	eating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts			
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	
(66)m= 136.21 136.21 136.21 136.21 136.21 136.21 136.21	1 136.21 136.21 136.21	136.21 136.21	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a)	also see Table 5		
Lighting gains (calculated in Appendix L, equation L9 or L9a) (67)m=		42.89 45.73	(67)
	21.56 28.94 36.75		(67)
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59	21.56 28.94 36.75 13a), also see Table 5		(67)
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59 Appliances gains (calculated in Appendix L, equation L13 or large)	21.56 28.94 36.75 .13a), also see Table 5 9 219.8 227.59 244.18	42.89 45.73	
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59 Appliances gains (calculated in Appendix L, equation L13 or least control (68)m= 297.94 301.03 293.24 276.65 255.72 236.04 222.8	21.56 28.94 36.75 .13a), also see Table 5 .9 219.8 227.59 244.18 a), also see Table 5	42.89 45.73	
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59 Appliances gains (calculated in Appendix L, equation L13 or least cooking gains (calculated in Appendix L, equation L15 or L15) Cooking gains (calculated in Appendix L, equation L15 or L15)	21.56 28.94 36.75 .13a), also see Table 5 .9 219.8 227.59 244.18 a), also see Table 5	42.89 45.73 265.12 284.79	(68)
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.58 Appliances gains (calculated in Appendix L, equation L13 or least control (68)m= 297.94 301.03 293.24 276.65 255.72 236.04 222.8 Cooking gains (calculated in Appendix L, equation L15 or L15	21.56 28.94 36.75 .13a), also see Table 5 .9 219.8 227.59 244.18 a), also see Table 5	42.89 45.73 265.12 284.79	(68)
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59 Appliances gains (calculated in Appendix L, equation L13 or least to the cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 50.89 50.89 50.89 50.89 50.89 50.89 50.89 50.89 Fumps and fans gains (Table 5a)	21.56 28.94 36.75 .13a), also see Table 5 9 219.8 227.59 244.18 a), also see Table 5 50.89 50.89 50.89	42.89 45.73 265.12 284.79 50.89 50.89	(68)
(67)m= 44.49 39.52 32.14 24.33 18.19 15.35 16.59 Appliances gains (calculated in Appendix L, equation L13 or least continuous gains (calculated in Appendix L, equation L15 or	21.56 28.94 36.75 13a), also see Table 5 219.8 227.59 244.18 a), also see Table 5 50.89 50.89 50.89 0 0 0	42.89 45.73 265.12 284.79 50.89 50.89	(68)

Water	heating	g gains (T	able 5)												
(72)m=	113.25	<u> </u>	106.99	101.24	97.51	9	92.26	87.79	93.	52 95.55	101.5	5 108.21	111.23]	(72)
Total i	nterna	ıl gains =					(66)	m + (67)m	ı + (68	B)m + (69)m + (70)m +	(71)m + (72))m	_	
(73)m=	551.98	-	528.66	498.52	467.71	4	39.95	423.57	431	.18 448.38	478.7	2 512.52	538.04]	(73)
6. So	lar gair	ns:													
Solar	gains are	calculated	using sola	r flux from	Table 6a	and	l assoc	iated equa	tions	to convert to the	e applic	able orientat	tion.		
Orienta	ation:	Access F		Area			Flu			_ g		FF		Gains	
		Table 6d		m²			Tal	ble 6a		Table 6b		Table 6c		(W)	
North	0.9x	1	X	1.8	35	X	1	0.63	x	0.4	x	0.8	=	5.67	(74)
North	0.9x	1	Х	2.3	36	X	1	0.63	X	0.4	x	0.8	=	7.23	(74)
North	0.9x	1	X	2.3	36	X	1	0.63	X	0.4	x	0.8	=	7.23	(74)
North	0.9x	1	Х	3.	6	X	1	0.63	x	0.4	x	0.8	=	11.02	(74)
North	0.9x	1	X	1.8	35	X	2	20.32	x	0.4	X	0.8	=	10.83	(74)
North	0.9x	1	X	2.3	36	X	2	20.32	X	0.4	x	0.8	=	13.81	(74)
North	0.9x	1	X	2.3	36	X	2	20.32	X	0.4	x	0.8	=	13.81	(74)
North	0.9x	1	X	3.	6	X	2	20.32	X	0.4	X	0.8	=	21.07	(74)
North	0.9x	1	X	1.8	35	X	3	34.53	X	0.4	X	0.8		18.4	(74)
North	0.9x	1	X	2.3	36	Х	3	34.53	х	0.4	x	0.8	=	23.47	(74)
North	0.9x	1	x	2.3	36	Х	3	34.53	x	0.4	x	0.8	=	23.47	(74)
North	0.9x	1	X	3.	6	X	3	34.53	x	0.4	x	0.8	=	35.8	(74)
North	0.9x	1	X	1.8	35	X	5	55.46	×	0.4	x	0.8	=	29.55	(74)
North	0.9x	1	X	2.3	36	x	5	55.46	Х	0.4	x	0.8	=	37.7	(74)
North	0.9x	1	х	2.3	36	Х	5	5.46	X	0.4	x	0.8	=	37.7	(74)
North	0.9x	1	X	3.	6	X	5	55.46	X	0.4	x	0.8	=	57.51	(74)
North	0.9x	1	X	1.8	35	X	7	4.72	x	0.4	x	0.8	=	39.81	(74)
North	0.9x	1	X	2.3	36	X	7	4.72	X	0.4	x	0.8	=	50.78	(74)
North	0.9x	1	X	2.3	36	X	7	4.72	x	0.4	x	0.8	=	50.78	(74)
North	0.9x	1	X	3.	6	X	7	4.72	X	0.4	X	0.8	=	77.47	(74)
North	0.9x	1	X	1.8	35	X	7	79.99	X	0.4	x	0.8	=	42.62	(74)
North	0.9x	1	Х	2.3	36	X	7	79.99	x	0.4	x	0.8	=	54.36	(74)
North	0.9x	1	X	2.3	36	X	7	'9.99	X	0.4	x	0.8	=	54.36	(74)
North	0.9x	1	X	3.	6	X	7	79.99	X	0.4	x	0.8	=	82.93	(74)
North	0.9x	1	X	1.8	35	X	7	' 4.68	X	0.4	x	0.8	=	39.79	(74)
North	0.9x	1	X	2.3	36	X	7	4.68	X	0.4	x	0.8	=	50.76	(74)
North	0.9x	1	X	2.3	36	X	7	4.68	X	0.4	x	0.8	=	50.76	(74)
North	0.9x	1	X	3.	6	X	7	4.68	X	0.4	X	0.8	=	77.42	(74)
North	0.9x	1	X	1.8	35	X	5	9.25	x	0.4	x	0.8	=	31.57	(74)
North	0.9x	1	X	2.3	36	X	5	9.25	x	0.4	x	0.8	=	40.27	(74)
North	0.9x	1	X	2.3	36	X	5	9.25	x	0.4	x	0.8	=	40.27	(74)
North	0.9x	1	X	3.	6	X	5	9.25	x	0.4	X	0.8	=	61.43	(74)

North			1		1		1		ı		1		٦,
North	0.9x	1	X	1.85	X	41.52	X	0.4	X	0.8	=	22.12	[74]
North	0.9x	1	X	2.36	X	41.52	X	0.4	X	0.8	=	28.22	(74)
North	0.9x	1	X	2.36	X	41.52	X	0.4	X	0.8	=	28.22	(74)
North	0.9x	1	X	3.6	X	41.52	Х	0.4	X	0.8	=	43.04	(74)
North	0.9x	1	X	1.85	X	24.19	X	0.4	X	0.8	=	12.89	(74)
North	0.9x	1	X	2.36	X	24.19	X	0.4	X	0.8	=	16.44	(74)
North	0.9x	1	X	2.36	X	24.19	X	0.4	X	0.8	=	16.44	(74)
North	0.9x	1	X	3.6	x	24.19	X	0.4	X	0.8	=	25.08	(74)
North	0.9x	1	X	1.85	x	13.12	X	0.4	X	0.8	=	6.99	(74)
North	0.9x	1	X	2.36	x	13.12	x	0.4	x	0.8	=	8.92	(74)
North	0.9x	1	X	2.36	x	13.12	X	0.4	X	0.8	=	8.92	(74)
North	0.9x	1	X	3.6	x	13.12	X	0.4	X	0.8	=	13.6	(74)
North	0.9x	1	x	1.85	x	8.86	x	0.4	x	0.8] =	4.72	(74)
North	0.9x	1	x	2.36	x	8.86	x	0.4	x	0.8] =	6.03	(74)
North	0.9x	1	x	2.36	x	8.86	x	0.4	х	0.8] =	6.03	(74)
North	0.9x	1	x	3.6	x	8.86	x	0.4	x	0.8] =	9.19	(74)
East	0.9x	1	x	2.36	x	19.64	x	0.4	x	0.8] =	13.35	(76)
East	0.9x	1	X	2.36	X	19.64	Х	0.4	Х	0.8	=	13.35	(76)
East	0.9x	1	x	2.36	х	38.42	x	0.4	х	0.8	=	26.11	(76)
East	0.9x	1	x	2.36	х	38.42	x	0.4	х	0.8] =	26.11	(76)
East	0.9x	1	X	2.36	x	63.27	x	0.4	х	0.8] =	43.01	(76)
East	0.9x	1	x	2.36	x	63.27	Х	0.4	х	0.8] =	43.01	(76)
East	0.9x	1	x	2.36	x	92.28	X	0.4	х	0.8] =	62.72	(76)
East	0.9x	1	X	2.36	х	92.28	x	0.4	х	0.8] =	62.72	(76)
East	0.9x	1	x	2.36	×	113.09	x	0.4	x	0.8] =	76.87	(76)
East	0.9x	1	x	2.36	x	113.09	х	0.4	x	0.8	=	76.87	(76)
East	0.9x	1	X	2.36	x	115.77	x	0.4	x	0.8] =	78.69	(76)
East	0.9x	1	X	2.36	x	115.77	x	0.4	x	0.8] =	78.69	(76)
East	0.9x	1	x	2.36	x	110.22	x	0.4	x	0.8] =	74.91	(76)
East	0.9x	1	x	2.36	x	110.22	x	0.4	х	0.8] =	74.91	(76)
East	0.9x	1	x	2.36	x	94.68	x	0.4	x	0.8	=	64.35	(76)
East	0.9x	1	×	2.36	×	94.68	x	0.4	x	0.8	j =	64.35	(76)
East	0.9x	1	x	2.36	x	73.59	x	0.4	x	0.8] =	50.02	(76)
East	0.9x	1	×	2.36	x	73.59	x	0.4	x	0.8] =	50.02	(76)
East	0.9x	1	X	2.36	x	45.59	x	0.4	x	0.8	=	30.99	(76)
East	0.9x	1	X	2.36	x	45.59	x	0.4	x	0.8	j =	30.99	(76)
East	0.9x	1	X	2.36	x	24.49	x	0.4	x	0.8	j =	16.64	(76)
East	0.9x	1	X	2.36	x	24.49	x	0.4	x	0.8	j =	16.64	(76)
East	0.9x	1	X	2.36	×	16.15	x	0.4	x	0.8	=	10.98	(76)
East	0.9x	1	X	2.36	x	16.15	X	0.4	x	0.8	=	10.98	(76)
	<u>L</u>		-		•				•		•		_

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m(83)(83)m =57.84 111.75 187.15 287.9 372.57 391.65 368.55 302.23 221.63 132.82 71.71 47.92

	gains – ii	nternal a	and solar	(84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	609.82	659.81	715.81	786.42	840.28	831.6	792.12	733.41	670.02	611.54	584.23	585.96		(84)
7. Me	ean inter	nal temr	perature	(heating	season)								
			neating p				from Tab	ole 9. Th	1 (°C)				21	(85)
		_	ains for I			_		,	(- /					`` ´
Otilio	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.99	0.97	0.94	0.84	0.65	0.46	0.33	0.37	0.61	0.88	0.97	0.99		(86)
. ,				ļ		<u> </u>				0.00	0.0.	0.00	ļ	. ,
		· ·	ature in		· `	i	i			ı		1	1	(07)
(87)m=	20.38	20.5	20.68	20.89	20.98	21	21	21	20.99	20.87	20.6	20.36	j	(87)
Temp	erature	during h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)				_	
88)m=	20.18	20.19	20.19	20.2	20.21	20.22	20.22	20.22	20.21	20.21	20.2	20.2		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.98	0.97	0.92	0.8	0.6	0.4	0.27	0.31	0.54	0.84	0.96	0.98		(89)
Moon	intorna	l tompor	ature in	the rest	of dwalli	na T2 (f	ollow sto	nc 2 to -	7 in Tabl	0.00)			ı	
90)m=	19.38	19.55	19.81	20.08	20.19	20.22	20.22	20.22	20.21	20.07	19.71	19.36	1	(90)
(30)111=	13.30	10.00	15.01	20.00	20.13	20.22	20.22	20.22		LA = Livin		<u> </u>	0.48	(91)
										Er (= Erviii	g aroa . (., –	0.40	(91)
Mear	_	temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
92)m=	19.86	20	20.23	20.47	20.57	20.59	20.59	20.59	20.58	20.45	20.14	19.84		(92)
Apply	<mark>/ ad</mark> justn	nent to t	he mean	internal	temper			4e, whe		opriate			,	
93)m=	19.86	20	20.23	20.47	20.57	20.59	20.59	20.59	20.58	20.45	20.14	19.84		(93)
			uirement							_				
			ternal ter			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
tne u	_		or gains			li in	lad	A	0.00	0-4	Nierr	Des	1	1
1.14:1:0.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
94)m=	0.98	0.97	ains, hm	0.81	0.63	0.43	0.3	0.34	0.57	0.86	0.96	0.98	1	(94)
,						0.43	0.3	0.34	0.57	0.86	0.96	0.96	ļ	(34)
95)m=		636.78	, W = (9 ² 662.63	ŕ	526.81	356.4	238	249	384.37	523.09	560.31	575.87	1	(95)
,			ernal tem			<u> </u>	230	243	304.37	323.09	300.31	373.07	J	(00)
96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
			an intern								7.1	7.2	J	(00)
97)m=		940.32	851.66	704.99	538.37	357.24	238.07	249.15	389.31	598.18	797.38	963.51	1	(97)
			ement fo			l						300.01	l	(01)
98)m=	279.1	203.98	140.64	47.14	8.6	0	0.02	0	0	55.87	170.69	288.41	1	
00)111–	270.1	200.00	140.04	77.17	0.0		Ŭ		l per year	<u> </u>		<u> </u>	1194.42	(98)
								Tota	i per year	(KWII/year) = Sum(9	O) _{15,912} =	1194.42	(90)
	_											i		
Spac	e heatin	g require	ement in	kWh/m²	?/year								16.82	(99)
•		• .	ement in quiremen		/year								16.82	(99)
8c. S	pace co	oling red		nt		ple 10b							16.82	(99)
8c. S	pace co	oling red	quiremen	nt		ole 10b Jun	Jul	Aug	Sep	Oct	Nov	Dec	16.82	(99)
8c. S Calcu	pace cou ulated fo Jan	oling rec r June, c Feb	duiremen	August. Apr	See Tal	Jun						L		(99)

Utilisation factor for loss hm										
(101)m = 0 0 0	0 0	0.97	0.99	0.98	0	0	0	0]	(101)
Useful loss, hmLm (Watts) =	(100)m x (101)m	1 <u> </u>		!					J	
(102)m = 0 0 0	0 0	545.71	436.83	443.98	0	0	0	0]	(102)
Gains (solar gains calculated		1			10)				1	
(103)m= 0 0 0	0 0	831.6	792.12	733.41	0	0	0	0]	(103)
Space cooling requirement for set (104)m to zero if (104)m	•	dwelling,	continuo	ous (kW	(h) = 0.0	24 x [(1	03)m – (102)m] :	x (41)m	
(104)m = 0 0 0	0 0	205.84	264.34	215.33	0	0	0	0]	
		•			Total	= Sum	(104)	=	685.5	(104)
Cooled fraction	- \				f C =	cooled	area ÷ (4) =	0.68	(105)
Intermittency factor (Table 10b (106)m= 0 0 0	0 0	0.25	0.25	0.25	0	0	0	0	1	
(100)] 0.20	0.20	0.20		= Sum	<u> </u>	=	0	(106)
Space cooling requirement for	month = (104)m	× (105) :	× (106)r	n						」 ` ′
(107)m= 0 0 0	0 0	35.01	44.96	36.62	0	0	0	0		_
					Total	= Sum	(107)	=	116.58	(107)
Space cooling requirement in	kWh/m²/year				(107)	÷ (4) =			1.64	(108)
9b. Energy requirements – Co										
This part is used for space hear from se	0. 1			.	•		unity scl	heme.	0	(301)
Fraction of space heat from co	mmunity system	1 – (301) =						1	(302)
The c <mark>ommu</mark> nity scheme m <mark>ay obt</mark> ain h	eat from several sou	rces. The p	rocedure .	allows for	CHP and t	up to four	other heat	t sources; t	he latter	_
includes boilers, heat pumps, geother		from power	stations.	See Apper	ndix C.					7(2020)
Fraction of heat from Commun							(0.00		1	(303a)
Fraction of total space heat from							802) x (303	3a) =	1	(304a)
Factor for control and charging	g method (Table	4c(3)) for	r commu	ınity hea	ting sys	tem			1	(305)
Distribution loss factor (Table	12c) for commur	nity heatin	ng syste	m					1.05	(306)
Space heating									kWh/year	_
Annual space heating requirer	nent								1194.42	╛
Space heat from Community h	neat pump				(98) x (30	04a) x (30	5) x (306)	=	1254.14	(307a)
Efficiency of secondary/supple	ementary heating	system i	in % (fro	m Table	4a or A	ppendix	(E)		0	(308
Space heating requirement from	m secondary/su	pplement	tary syst	em	(98) x (30	01) x 100	÷ (308) =		0	(309)
Water heating										_
Annual water heating requiren									1923.11	
If DHW from community scher Water heat from Community h					(64) x (30	03a) x (30	5) x (306)	=	2019.26	(310a)
Electricity used for heat distrib	ution			0.01	× [(307a).	(307e) -	+ (310a)	(310e)] =	32.73	(313)
Cooling System Energy Efficie	ency Ratio								6.25	(314)
Space cooling (if there is a fixe	ed cooling syster	n, if not e	enter 0)		= (107) ÷	(314) =			18.65	(315)
Electricity for pumps and fans										-
mechanical ventilation - balan	ced, extract or po	ositive inp	out from	outside					173.24	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330b) + (330g) =	173.24	(331)
Energy for lighting (calculated in Apper	ndix L)		314.29	(332)
Total delivered energy for all uses (307	() + (309) + (310) + (312) + (315)	+ (331) + (332)(237b) =	3779.58	(338)
10b. Fuel costs – Community heating	scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 x 0.01 =	53.18	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	85.62	(342a)
		Fuel Price		
Space cooling (community cooling syst	,	13.19 × 0.01 =	2.10	(348)
Pumps and fans	(331)	13.19 × 0.01 =	22.00	(349)
Energy for lighting	(332)	13.19 x 0.01 =	41.45	(350)
Additional standing charges (Table 12)			120	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		325.56	(355)
11b. SAP rating - Community heating	scheme			
Energy cost deflator (Table 12)	(050) (050)		0.42	(356)
Energy cost factor (ECF)	$[(355) \times (356)] \div [(4) + 45.0] =$		1.18	(357)
SAP rating (section12)	ting sohomo		83.56	(358)
12b. CO2 Emissions – Community hea		ergy Emission factor	Emissions	
		h/year kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	3 \ ,	repeat (363) to (366) for the second fu	iel 364	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x 0.52	= 466.73	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 16.99	(372)
Total CO2 associated with community s	systems (363)(3	66) + (368)(372)	= 483.72	(373)
CO2 associated with space heating (se	econdary) (309) x	0	= 0	(374)
CO2 associated with water from immer	sion heater or instantaneous hea	ater (312) x 0.52	= 0	(375)
Total CO2 associated with space and v	vater heating (373) + (3	74) + (375) =	483.72	(376)
CO2 associated with space cooling	(315) x	0.52	9.68	(377)
CO2 associated with electricity for pum	ps and fans within dwelling (331	0.52	= 89.91	(378)
CO2 associated with electricity for light	ing (332))) x	0.52	= 163.12	(379)
Total CO2, kg/year	sum of (376)(382) =	<u> </u>	746.43	(383)
Total CO2, kg/year Dwelling CO2 Emission Rate	sum of (376)(382) = (383) ÷ (4) =		746.43 10.51	(383)

El rating (section 14)			91.38	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not CHI Efficiency of heat source 1 (%)	P) g two fuels repeat (363) to	(366) for the second	fuel 364	(367a)
Energy associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	3.07	= 2760.81	(367)
Electrical energy for heat distribution	[(313) x		= 100.49	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= 2861.3	(373)
if it is negative set (373) to zero (unless specified otherwise, s	see C7 in Appendix C	C)	2861.3	(373)
Energy associated with space heating (secondary)	(309) x	0	= 0	(374)
Energy associated with water from immersion heater or instanta	aneous heater(312) x	3.07	= 0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		2861.3	(376)
Energy associated with space cooling	(315) x	3.07	= 57.27	(377)
Energy associated with electricity for pumps and fans within dwe	elling (331)) x	3.07	= 531.85	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= 964.86	(379)
Total Primary Energy, kWh/year sum of (376).	.(382) =		4415.27	(383)

		User D	etails:						
Assessor Name:			Stroma						
Software Name:	Stroma FSAP 2012		Softwa			05 to 5		n: 1.0.5.57	
Address :	Twickenham London Squar		Address:	Greg B	акегу г	оэ тор г	loor .		
1. Overall dwelling dime	·	e, Londo) i i						
3		Area	a(m²)		Av. He	ight(m)		Volume(m ³)
Ground floor			71	(1a) x	2	2.5	(2a) =	177.5	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	71	(4)			-		_
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	177.5	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	ns				0	x .	10 =	0	(7a)
Number of passive vents				Ī	0	x	10 =	0	(7b)
Number of flueless gas fin	res			Γ	0	X 4	40 =	0	(7c)
							Δir ch	nanges per ho	r
Infiltration due to chimne	/s, flues and fans = (6a)+(6b)+(7a)+(7b)+(76) -	_					_
	een carried out or is intended, procee			ontinue fr	0 rom (9) to i		÷ (5) =	0	(8)
Number of storeys in th						-/		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openin	esent, use the value corresponding to	o the great	er wall area	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	envelope	area	3	(17)
·	ty value, then $(18) = [(17) \div 20] + (18) = [(17) \div 20]$							0.15	(18)
Air permeability value applies Number of sides sheltere	s if a pressurisation test has been do d	ne or a deg	gree air pei	meability	is being u	sed		_	7(10)
Shelter factor	u		(20) = 1 - [0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified for								0.10	` ′
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2\m ÷ 4							-	
	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
,	1 1 3.00	L				L <u>-</u>		I	

Adjusted infiltrat	ion rate	allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effecti		-	rate for t	he appli	cable ca	ise	•	•	•	•	•	•	(oo)
If exhaust air hea			andiv N (2	3h) - (23s	a) v Emy (4	aguation (N5N othe	rwisa (23h) – (23a)			0.5	(23a)
If balanced with h		•	•	, ,	,	•		,) = (20a)			0.5	(23b)
a) If balanced		-	-	_					2h)m + (23h) 🗴 [1	1 <i>– (23c</i>)	77.35 1001	(23c)
(24a)m= 0.3	0.3	0.3	0.28	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.29]	(24a)
b) If balanced	mecha	nical ve	entilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (23b)		<u>l</u>	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole hou	use ext	ract ver	ntilation o	or positiv	e input	ventilatio	on from o	outside	•	•	•	•	
if (22b)m -	< 0.5 ×	(23b), t	then (24d	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b) '	ı	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ve if (22b)m :									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air cl	hange r	ate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.3	0.3	0.3	0.28	0.27	0.26	0.26	0.25	0.26	0.27	0.28	0.29		(25)
3. Heat losses	and hea	at loss i	paramete	er:								_	
ELEMENT	Gross area (Openin		Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
Doo <mark>rs</mark>										/			
					2.1	X	1.3	=	2.73				(26)
Windows Type 1	1				2.1		1.3 /[1/(1.3)+		2.73	R			(26) (27)
Windows Type 1 Windows Type 2						x1		0.04] =					
	2				2.36	x1	/[1/(1.3)+	0.04] =	2.92				(27)
Windows Type 2	2				2.36	x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+	0.04] = [0.04] = [0.04] =	2.92				(27) (27)
Windows Type 2 Windows Type 3	2 3 4				2.36 2.36 1.85	x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = $\begin{bmatrix} 0.04 \end{bmatrix}$	2.92 2.92 2.29				(27) (27) (27)
Windows Type 2 Windows Type 3 Windows Type 4	2 3 4 5				2.36 2.36 1.85 2.36	x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92				(27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 5	2 3 4 5	6	10.1	7	2.36 2.36 1.85 2.36 2.36	x1 x1 x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92				(27) (27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6	2 3 4 5 5 6 6	_	10.1	=	2.36 2.36 1.85 2.36 2.36 3.6	x1 x1 x1 x1 x1 x1 x1 x1	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92 4.45				(27) (27) (27) (27) (27) (27)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type 1	2 3 4 5 5 27.36			=	2.36 2.36 2.36 2.36 3.6	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 1.85 2.36 2.36 3.6 17.19	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29) (29)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58				(27) (27) (27) (27) (27) (27) (29) (29) (30)
Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1 24.88	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 1.85 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32)
Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 2.36	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a)
Windows Type 2 Windows Type 2 Windows Type 2 Windows Type 6 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 2.36 17.19 12.98 102 149.1 24.88 18 71 25.49	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c)
Windows Type 2 Windows Type 3 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall ** Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88 71 25.49 22.19	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c) (32c)
Windows Type 2 Windows Type 2 Windows Type 3 Windows Type 5 Windows Type 6 Walls Type1 Walls Type2 Roof Total area of ele Party wall Party wall Party floor Internal wall ** Internal wall **	2 3 4 5 6 27.36 19.8		6.82	=	2.36 2.36 2.36 2.36 2.36 2.36 3.6 17.19 12.98 102 149.1 24.88 71 25.49 22.19 23.75	x1 x	/[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.3)+ 0.15 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = =	2.92 2.92 2.29 2.92 2.92 4.45 2.58 1.95 15.3				(27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32) (32) (32a) (32c) (32c) (32c)

Interna	ıl floor					74	\neg				г			(32d)
		roof wind	ows, use e	effective wi	indow U-va	71 alue calcul	l ated using	ı formula 1	/[(1/U-valu	ıe)+0.041 á	L as aiven in	naragraph		(320)
					ls and part		atou aonig	,	, [(,	.c g	paragrapi	3.2	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$											40.96	(33)		
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) =											17525.78	(34)		
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium											250	(35)		
	-				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
			tailed calc		uoina An	nondiy l	/							(20)
Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31)											3.69	(36)		
	abric he		aro not nii	omi (00) -	- 0.00 x (0	'/			(33) +	(36) =			44.64	(37)
Ventila	tion hea	at loss ca	alculated	l monthly	у				(38)m	= 0.33 × (25)m x (5)		-	`
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.84	17.62	17.4	16.3	16.08	14.98	14.98	14.76	15.42	16.08	16.52	16.96		(38)
Heat tr	ansfer o	coefficier	nt. W/K				ı		(39)m	= (37) + (38)m			
(39)m=	62.48	62.26	62.04	60.94	60.72	59.62	59.62	59.4	60.06	60.72	61.16	61.6		
			l		l		l	l	,	L Average =	Sum(39) _{1.}	12 /12=	60.89	(39)
Heat Ic	ss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		_
Numbe	or of day	e in moi	nth (Tab	lo 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.86	(40)
INUITIDE	Jan	Feb	Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	31	30	31	31	30 30	31	30	31		(41)
(+1)111=	01	20	91		01			01	00	01		01		(,
4 10/-	to book											1-10/1-/		
4. Wa	iter heat	ing ener	rgy requ	irement:								kWh/ye	ear:	
Assum	ed occu	ipancy, I	N									kWh/ye	ear:	(42)
Assum if TF	ed occu A > 13.9	ipancy, l 9, N = 1	N		0(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.			ear:	(42)
Assum if TF if TF	ed occu A > 13.9 A £ 13.9	ipancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp						ГҒА -13	.9)	27	ear:	
Assum if TF if TF Annua Reduce	ed occu A > 13.9 A £ 13.9 I averag the annua	ipancy, I 9, N = 1 9, N = 1 e hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		.9)		ear:	(42)
Assum if TF if TF Annua Reduce	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per l	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by	es per da 5% if the d	ay Vd,av welling is not and co	erage = designed (ld)	(25 x N)	+ 36 a water us	se target o	9) 88	.12	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa litres per l Feb	N + 1.76 x ater usaç hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		.9)	27	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125 Jan er usage in	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per l Feb	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, h May Vd,m = fac	ay Vd,av welling is not and co Jun ctor from	erage = designed to ld) Jul Table 1c x	(25 x N) to achieve Aug	+ 36 a water us Sep	se target o	9) 88 Nov	.12 Dec	ear:	
Assum if TF if TF Annua Reduce not more	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125	ipancy, I 9, N = 1 9, N = 1 e hot wa litres per l Feb	N + 1.76 x ater usaç hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, h	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep	Oct	9) 88 Nov 93.4	.12 Dec		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I averag the annual of that 125 Jan er usage in	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by day (all w Apr ach month 86.35	es per da 5% if the d vater use, h May Vd,m = fac	ay Vd,av welling is not and co Jun ctor from 7	erage = designed to ld) Jul Table 1c x 79.3	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35	Oct 89.88 Total = Su	9) 88 Nov 93.4 m(44) ₁₁₂ =	.12 Dec 96.93	ear: 1057.39	
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I averag the annual of that 125 Jan er usage in	ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by day (all w Apr ach month 86.35	es per da 5% if the d vater use, h May Vd,m = fac 82.83	ay Vd,av welling is not and co Jun ctor from 7	erage = designed to ld) Jul Table 1c x 79.3	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35	Oct 89.88 Total = Su	9) 88 Nov 93.4 m(44) ₁₁₂ =	.12 Dec 96.93		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan er usage in 96.93	pancy, I 9, N = 1 9, N = 1 e hot wa al average litres per I Feb n litres per 93.4	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by day (all w Apr ach month 86.35	es per da 5% if the d vater use, h May Vd,m = fac 82.83	y Vd,av welling is not and co Jun ctor from 7 79.3	erage = designed to ld) Jul Table 1c x 79.3	(25 x N) to achieve Aug (43) 82.83	+ 36 a water us Sep 86.35 0 kWh/mon 100.77	Oct 89.88 Total = Su 117.44	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1	27 .12 Dec 96.93		(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	ed occu A > 13.9 A £ 13.9 I averag the annual e that 125 Jan gr usage in 96.93	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per p Feb n litres per 93.4 hot water	N + 1.76 x ater usag hot water person per Mar day for ea 89.88 used - cal	[1 - exp ge in litre usage by a day (all w Apr ach month 86.35	es per da 5% if the d vater use, h May Vd,m = fac 82.83	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78	(25 x N) to achieve Aug (43) 82.83 97m / 3600 99.58	+ 36 a water us Sep 86.35 6 kWh/more	Oct 89.88 Total = Su 117.44	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19	27 .12 Dec 96.93	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m=	ed occu A > 13.9 A £ 13.9 I averag the annual e that 125 Jan 96.93 content of 143.74	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per p Feb 1 litres per 93.4 hot water 125.72 vater heatii	N + 1.76 x ater usag hot water person per Mar day for ea 89.88 used - cal	[1 - exp ge in litre usage by a day (all w Apr ach month 86.35	es per da 5% if the dayater use, H May Vd,m = fac 82.83 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78	(25 x N) to achieve Aug (43) 82.83 97m / 3600 99.58	+ 36 a water us Sep 86.35 6 kWh/more	Oct 89.88 Total = Su 117.44	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19	27 .12 Dec 96.93	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water	ed occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage	pancy, I P, N = 1 P, N = 1 e hot wa al average litres per I Feb n litres per 93.4 hot water 125.72 vater heatin 18.86 loss:	N + 1.76 x ater usage hot water person per Mar reday for ear 129.73 ng at point 19.46	[1 - exp ge in litre usage by day (all w Apr ach month 86.35 culated mo 113.1	es per da 5% if the da rater use, he May Vd,m = fact 82.83 conthly = 4. 108.52 co hot water 16.28	y Vd,av welling is not and co Jun 79.3 190 x Vd,r 93.65	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02	(25 x N) to achieve Aug (43) 82.83 DTm / 3600 99.58 boxes (46) 14.94	+ 36 a water us Sep 86.35 b kWh/more 100.77 c) to (61) 15.12	Oct 89.88 Total = Su 117.44 Total = Su 17.62	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 .12 .96.93	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag	ed occu A > 13.9 A £ 13.9 I averag the annual e that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum	pancy, I P, N = 1 e hot wa al average litres per I Feb 1 125.72 pater heatil 18.86 loss: e (litres)	N + 1.76 x ater usage hot water person per Mar r day for ear 89.88 used - cal 129.73 ng at point 19.46	ge in litre usage by day (all w Apr ach month 86.35 culated mo 113.1 for use (no	es per da 5% if the day ater use, he May Vd,m = fact 82.83 conthly = 4. 108.52 co hot water 16.28 colar or W	y Vd,av welling is not and co Jun 79.3 190 x Vd,r 93.65 storage),	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage	(25 x N) to achieve Aug (43) 82.83 99.58 boxes (46) 14.94 within sa	+ 36 a water us Sep 86.35 b kWh/more 100.77 c) to (61) 15.12	Oct 89.88 Total = Su 117.44 Total = Su 17.62	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ =	27 .12 .12 .96.93	1057.39	(43)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comr	led occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum	pancy, I P, N = 1 e hot wa al average litres per I Feb n litres per 93.4 hot water 125.72 vater heatin 18.86 loss: e (litres)	N + 1.76 x ater usage hot water person person person person person person person at 29.73 129.73 129.73 19.46 includirated no tallocated at point and no tallocated at person	ge in litre usage by day (all w Apr ach month 86.35 culated me 113.1 of use (no	es per da 5% if the day tester use, if May Vd,m = fact 82.83 conthly = 4. 108.52 control water 16.28 colar or Waterly elling, e	y Vd,av welling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 storage), 14.05	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage litres in	(25 x N) to achieve Aug (43) 82.83 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 b kWh/mor 100.77 15.12 ame vess	Oct 89.88 Total = Su 117.44 Total = Su 17.62 sel	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ = 19.23	27 .12 .12 .12 .12 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comr Otherw	ed occu A > 13.9 A £ 13.9 I averag the annua e that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum munity h vise if no	pancy, I P, N = 1 P, N = 1 Pe hot wa al average litres per l Peb n litres per 93.4 hot water 125.72 rater heatin 18.86 loss: e (litres) eating a p stored	N + 1.76 x ater usage hot water person person person person person person person at 29.73 129.73 129.73 19.46 includirated no tallocated at point and no tallocated at person	ge in litre usage by day (all w Apr ach month 86.35 culated me 113.1 of use (no	es per da 5% if the day ater use, he May Vd,m = fact 82.83 conthly = 4. 108.52 co hot water 16.28 colar or W	y Vd,av welling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 storage), 14.05	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage litres in	(25 x N) to achieve Aug (43) 82.83 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 b kWh/mor 100.77 15.12 ame vess	Oct 89.88 Total = Su 117.44 Total = Su 17.62 sel	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ = 19.23	27 .12 .12 .12 .12 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13	1057.39	(43) (44) (45) (46)
Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Water	ed occu A > 13.9 A £ 13.9 I averag the annual that 125 Jan 96.93 content of 143.74 taneous w 21.56 storage e volum munity h vise if no	pancy, I P, N = 1 P, N = 1 Pe hot wa al average litres per I Peb palitres per P3.4 hot water 125.72 rater heatil 18.86 loss: e (litres) eating a p stored loss:	N + 1.76 x ater usage hot water person per Mar reday for ear 89.88 used - cal 129.73 ng at point 19.46 includir and no tal hot water services and services are services as a services are services as a services are services and services are services a	ge in litre usage by day (all w Apr ach month 86.35 culated mo 113.1 for use (no 16.97 and any so ank in dw er (this in	es per da 5% if the day tester use, if May Vd,m = fact 82.83 conthly = 4. 108.52 control water 16.28 colar or Waterly elling, e	y Vd,av welling is not and co Jun ctor from 7 79.3 190 x Vd,r 93.65 14.05 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 79.3 m x nm x E 86.78 enter 0 in 13.02 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 82.83 99.58 boxes (46) 14.94 within sa (47)	+ 36 a water us Sep 86.35 b kWh/mor 100.77 15.12 ame vess	Oct 89.88 Total = Su 117.44 Total = Su 17.62 sel	9) 88 Nov 93.4 m(44) ₁₁₂ = ables 1b, 1 128.19 m(45) ₁₁₂ = 19.23	27 .12 .12 .12 .12 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13	1057.39	(43) (44) (45) (46)

								(50)	
Energy lost from water storage, kWh/year (48) x (49) = 0.72 b) If manufacturer's declared cylinder loss factor is not known:									
Hot water storage loss factor from Table 2 (kWh/litre/day)									
If community heating see section 4.3									
Volume factor from Table 2a	. 01-					0		(52)	
Temperature factor from Table		((= () (==)	(=o)		0		(53)	
Energy lost from water storage	, kwh/year	(47)	(51) x (52) x	(53) =	-	70		(54) (55)	
Enter (50) or (54) in (55) 0.72 Water storage loss calculated for each month $((56)m = (55) \times (41)m)$									
(56)m= 22.32 20.16 22.32	21.6 22.32 21.6		-	22.32	21.6	22.32		(56)	
If cylinder contains dedicated solar sto							ix H	(00)	
(57)m= 22.32 20.16 22.32	21.6 22.32 21.6			22.32	21.6	22.32		(57)	
` ' <u>L </u>		22.32 22	21.0	22.52	<u> </u>	<u> </u>			
Primary circuit loss (annual) from Primary circuit loss calculated		_ (E0) + 26E v	(11)m			0		(58)	
(modified by factor from Tab	` '	` '		er thermo	stat)				
(59)m= 23.26 21.01 23.26	22.51 23.26 22.5	 		23.26	22.51	23.26		(59)	
Combi loss calculated for each	month (61)m - (60) ÷	365 × (41)m			<u>I</u>	<u>I</u>	l		
(61)m= 0 0 0		0 0	0	0	0	0		(61)	
Total heat required for water h	eating calculated for e				(46)m +		(59)m + (61)m		
(62)m= 189.32 166.89 175.31	157.21 154.11 137.7			163.02	172.3	184.79		(62)	
Solar DHW input calculated using App									
(add additional lines if FGHRS									
(63)m= 0 0 0	0 0 0	0 (0	0	0	0		(63)	
Output from water heater						•			
(64)m= 189.32 166.89 175.31	157.21 154.11 137.7	6 132.36 145	16 144.88	163.02	172.3	184.79			
			Output from v	ater heater	r (annual)₁	12	1923.11	(64)	
Heat gains from water heating	, kWh/month 0.25 ´ [0.8	85 × (45)m + (6	1)m] + 0.8	x [(46)m	+ (57)m	+ (59)m]		
(65)m= 84.26 74.74 79.6	72.9 72.55 66.43	65.32 69	68.79	75.51	77.91	82.75		(65)	
include (57)m in calculation	of (65)m only if cylinde	r is in the dwel	ing or hot v	vater is fr	om com	munity h	eating		
5. Internal gains (see Table 5	5 and 5a):								
Metabolic gains (Table 5), Wat	tts						ı		
Jan Feb Mar	Apr May Jur		ug Sep	Oct	Nov	Dec			
(66)m= 113.51 113.51 113.51	113.51 113.51 113.5	!!	ļ	113.51	113.51	113.51		(66)	
Lighting gains (calculated in A	' 			,	·		I		
(67)m= 17.8 15.81 12.85	9.73 7.27 6.14	6.64 8.0	3 11.58	14.7	17.16	18.29		(67)	
Appliances gains (calculated in			-				ı		
(68)m= 199.62 201.69 196.47	185.36 171.33 158.1	5 149.34 147	27 152.49	163.6	177.63	190.81		(68)	
Cooking gains (calculated in A									
(69)m= 34.35 34.35 34.35	34.35 34.35 34.35	5 34.35 34	34.35	34.35	34.35	34.35		(69)	
Pumps and fans gains (Table s	, , , , , , , , , , , , , , , , , , , 			1			ı		
(70)m= 0 0 0	0 0 0	0 (0	0	0	0		(70)	
	Losses e.g. evaporation (negative values) (Table 5)								
(71)m= -90.81 -90.81 -90.81	-90.81 -90.81 -90.8	1 -90.81 -90	81 -90.81	-90.81	-90.81	-90.81		(71)	

Water heating gains (Table 5)															
(72)m=	113.25	111.22	106.99	101.24	97.51	9	2.26	87.79	93.	52 95.55	101.5	5 108.21	111.23		(72)
Total i	nternal	gains =				•	(66)	m + (67)m	+ (68	3)m + (69)m +	(70)m +	(71)m + (72)	m		
(73)m=	387.72	385.77	373.37	353.39	333.17	3	313.6	300.82	306	.46 316.67	336.8	5 360.05	377.38		(73)
6. So	lar gains	S:													
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.															
Orient		Access F	actor	Area			Flu			g_ -		FF		Gains	
		Table 6d		m²			ı a	ble 6a	_	Table 6b		Table 6c		(W)	
North	0.9x	0.77	X	1.8	35	X	1	0.63	X	0.4	X	0.8	=	4.36	(74)
North	0.9x	0.77	X	2.3	36	X	1	0.63	X	0.4	X	0.8	=	5.57	(74)
North	0.9x	0.77	X	2.3	36	X	1	0.63	X	0.4	X	0.8	=	5.57	(74)
North	0.9x	0.77	X	3.	6	X	1	0.63	X	0.4	X	0.8	=	8.49	(74)
North	0.9x	0.77	X	1.8	35	X	2	20.32	X	0.4	X	0.8	=	8.34	(74)
North	0.9x	0.77	X	2.3	36	X	2	20.32	X	0.4	X	0.8	=	10.64	(74)
North	0.9x	0.77	X	2.3	36	X	2	20.32	X	0.4	X	0.8	=	10.64	(74)
North	0.9x	0.77	X	3.	6	X	2	20.32	X	0.4	X	0.8		16.22	(74)
North	0.9x	0.77	X	1.8	35	X	3	34.53	_ X	0.4	X	0.8	=	14.17	(74)
North	0.9x	0.77	x	2.3	36	X	3	34.53	x	0.4	X	0.8		18.07	(74)
North	0.9x	0.77	X	2.3	36	Х	3	34.53	x	0.4	X	0.8	=	18.07	(74)
North	0.9x	0.77	X	3.	6	X	3	34.53	X	0.4	X	0.8	=	27.57	(74)
North	0.9x	0.77	X	1.8	35	X	5	55.46	×	0.4	X	0.8	=	22.75	(74)
North	0.9x	0.77	X	2.3	36	x	5	55.46	Х	0.4	X	0.8	=	29.03	(74)
North	0.9x	0.77	X	2.3	36	Х		5.46	X	0.4	X	0.8	=	29.03	(74)
North	0.9x	0.77	X	3.	6	Х	5	55.46	X	0.4	X	0.8	=	44.28	(74)
North	0.9x	0.77	X	1.8	35	X	7	4.72	X	0.4	X	0.8	=	30.65	(74)
North	0.9x	0.77	X	2.3	36	X	7	4.72	X	0.4	X	0.8	=	39.1	(74)
North	0.9x	0.77	X	2.3	36	X	7	4.72	X	0.4	X	0.8	=	39.1	(74)
North	0.9x	0.77	X	3.	6	X	7	4.72	X	0.4	X	0.8	=	59.65	(74)
North	0.9x	0.77	X	1.8	35	X	7	79.99	X	0.4	X	0.8	=	32.81	(74)
North	0.9x	0.77	X	2.3	36	X	7	79.99	X	0.4	X	0.8	=	41.86	(74)
North	0.9x	0.77	X	2.3	36	X	7	79.99	X	0.4	X	0.8	=	41.86	(74)
North	0.9x	0.77	X	3.	6	X	7	79.99	X	0.4	X	0.8	=	63.86	(74)
North	0.9x	0.77	X	1.8	35	X	7	74.68	X	0.4	X	0.8	=	30.64	(74)
North	0.9x	0.77	X	2.3	36	X	7	74.68	X	0.4	X	0.8	=	39.08	(74)
North	0.9x	0.77	X	2.3	36	X	7	74.68	X	0.4	X	0.8	=	39.08	(74)
North	0.9x	0.77	X	3.	6	X	7	74.68	X	0.4	X	0.8	=	59.62	(74)
North	0.9x	0.77	X	1.8	35	X		9.25	x	0.4	X	0.8	=	24.31	(74)
North	0.9x	0.77	X	2.3	36	X	5	9.25	X	0.4	X	0.8	=	31.01	(74)
North	0.9x	0.77	X	2.3	36	X	5	9.25	X	0.4	X	0.8	=	31.01	(74)
North	0.9x	0.77	X	3.	6	X		59.25	x	0.4	X	0.8	=	47.3	(74)

North	F		1		1		1	_	1		1	Γ	٦,-,،
North	0.9x	0.77	X	1.85	X	41.52	X	0.4	X	0.8	=	17.03	(74)
North	0.9x	0.77	X	2.36	X	41.52	X	0.4	X	0.8] = 1	21.73	(74)
North	0.9x	0.77	X	2.36	X	41.52	X 1	0.4	X	0.8] = 1	21.73	(74)
North	0.9x	0.77	X	3.6	X	41.52	X	0.4	X	0.8] =	33.14	(74)
North	0.9x	0.77	X	1.85	X	24.19	X	0.4	X	0.8	=	9.92	(74)
North	0.9x	0.77	X	2.36	X	24.19	X	0.4	X	0.8	=	12.66	(74)
North	0.9x	0.77	X	2.36	Х	24.19	X	0.4	X	0.8	=	12.66	(74)
North	0.9x	0.77	X	3.6	X	24.19	X	0.4	X	0.8	=	19.31	(74)
North	0.9x	0.77	X	1.85	X	13.12	X	0.4	X	0.8] =	5.38	(74)
North	0.9x	0.77	X	2.36	X	13.12	X	0.4	X	0.8	=	6.87	(74)
North	0.9x	0.77	X	2.36	X	13.12	X	0.4	X	0.8	=	6.87	(74)
North	0.9x	0.77	X	3.6	X	13.12	X	0.4	X	0.8	=	10.47	(74)
North	0.9x	0.77	X	1.85	X	8.86	X	0.4	X	0.8	=	3.64	(74)
North	0.9x	0.77	X	2.36	X	8.86	X	0.4	X	0.8	=	4.64	(74)
North	0.9x	0.77	x	2.36	x	8.86	X	0.4	X	0.8	=	4.64	(74)
North	0.9x	0.77	X	3.6	X	8.86	X	0.4	X	0.8	=	7.08	(74)
East	0.9x	0.77	X	2.36	X	19.64	X	0.4	X	0.8	=	10.28	(76)
East	0.9x	0.77	X	2.36	X	19.64	Х	0.4	X	0.8	=	10.28	(76)
East	0.9x	0.77	x	2.36	х	38.42] x	0.4	x	0.8	=	20.11	(76)
East	0.9x	0.77	x	2.36	х	38.42	x	0.4	x	0.8	=	20.11	(76)
East	0.9x	0.77	x	2.36	X	63.27	x	0.4	x	0.8	=	33.11	(76)
East	0.9x	0.77	x	2.36	x	63.27	Х	0.4	x	0.8	=	33.11	(76)
East	0.9x	0.77	x	2.36	х	92.28	X	0.4	x	0.8	=	48.3	(76)
East	0.9x	0.77	x	2.36	х	92.28	X	0.4	x	0.8	=	48.3	(76)
East	0.9x	0.77	X	2.36	X	113.09	X	0.4	x	0.8	=	59.19	(76)
East	0.9x	0.77	X	2.36	X	113.09	x	0.4	x	0.8	=	59.19	(76)
East	0.9x	0.77	X	2.36	x	115.77	X	0.4	x	0.8] =	60.59	(76)
East	0.9x	0.77	x	2.36	x	115.77	x	0.4	x	0.8	=	60.59	(76)
East	0.9x	0.77	x	2.36	x	110.22	x	0.4	x	0.8	=	57.68	(76)
East	0.9x	0.77	x	2.36	x	110.22	x	0.4	x	0.8	=	57.68	(76)
East	0.9x	0.77	x	2.36	x	94.68	X	0.4	x	0.8	=	49.55	(76)
East	0.9x	0.77	x	2.36	x	94.68	x	0.4	x	0.8	=	49.55	(76)
East	0.9x	0.77	x	2.36	x	73.59	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	2.36	x	73.59	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	x	2.36	х	45.59	x	0.4	x	0.8] <u>=</u>	23.86	(76)
East	0.9x	0.77	×	2.36	x	45.59	x	0.4	x	0.8] =	23.86	(76)
East	0.9x	0.77	x	2.36	x	24.49	x	0.4	x	0.8] =	12.82	(76)
East	0.9x	0.77	x	2.36	x	24.49	x	0.4	x	0.8	j =	12.82	(76)
East	0.9x	0.77	x	2.36	x	16.15	x	0.4	x	0.8	j =	8.45	(76)
East	0.9x	0.77	x	2.36	x	16.15	x	0.4	x	0.8] =	8.45	(76)
	_		•		•		. '		1		•		_

(83)m = Sum(74)m ...(82)m

170.66

102.27

55.22

36.9

232.72

283.78

221.68

286.88

301.57

Solar gains in watts, calculated for each month

144.1

86.04

(83)m =

44.54

(83)

Total g	jains – i	nternal a	and solai	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	432.26	471.81	517.47	575.07	620.05	615.17	584.61	539.18	487.32	439.12	415.27	414.28		(84)
7. Me	an inter	nal tem	perature	(heating	season)								
		•		`		,	from Tab	ole 9. Th	1 (°C)				21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a)											`` ′			
O timo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.95	0.82	0.61	0.45	0.5	0.79	0.97	0.99	1		(86)
. ,		1 4		L	T4 //:	. !!	2 +		- 0-)				l	
(87)m=	20.15	20.26	20.46	20.73	20.92	20.99	ps 3 to 7	21	20.96	20.71	20.39	20.13	1	(87)
		<u> </u>		<u> </u>	ļ	<u> </u>	ļ	ļ		20.71	20.59	20.13	l	(01)
				i	i e		from Ta	ì	<u>`</u>		Ι	ı	I	(22)
(88)m=	20.18	20.19	20.19	20.2	20.21	20.22	20.22	20.22	20.21	20.21	20.2	20.2		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)	_		_	_	_	
(89)m=	1	0.99	0.98	0.93	0.77	0.54	0.37	0.42	0.72	0.95	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.04	19.2	19.49	19.89	20.13	20.21	20.22	20.22	20.18	19.87	19.4	19.03		(90)
				!			!		f	LA = Livin	g area ÷ (4	4) =	0.48	(91)
Moan	intorna	I tompor	aturo (fo	or the wh	ole dwe	lling) – f	LA × T1	⊥ (1 _ fl	۸) ی T2					
(92)m=	19.57	19.71	19.96	20.29	20.51	20.59	20.59	20.59	20.55	20.27	19.88	19.56		(92)
							m Table				10.00	10.00	l	(/
(93)m=	19.57	19.71	19.96	20.29	20.51	20.59	20.59	20.59	20.55	20.27	19.88	19.56		(93)
			uirement											
Set T	i to the i	mean in		mperatu		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
ti io di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		I way	<u> </u>	<u> </u>	l rug	СОР	001	1101			
(94)m=	1	0.99	0.98	0.93	0.79	0.57	0.41	0.46	0.75	0.96	0.99	1		(94)
Usefu	∟—— ıl gains,	hmGm	, W = (9	4)m x (8	4)m	ļ	<u> </u>	<u> </u>	ļ		<u> </u>	ļ	l	
(95)m=		468.35	507.49	535.65	492.16	352.48	237.63	248.2	365.55	419.71	411.78	413.03		(95)
Montl	nly aver	age exte	ernal tem	perature	from Ta	able 8							J	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			_	
(97)m=	954.11	921.95	834.79	694.18	534.99	356.87	238.03	249.07	387.52	587.35	781.42	945.98		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k	/Vh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m		•	
(98)m=	389.5	304.82	243.51	114.14	31.87	0	0	0	0	124.72	266.15	396.51		
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	1871.21	(98)
Space	e heatin	g requir	ement in	kWh/m²	²/year								26.36	(99)
8c. S	pace co	oling red	quiremer	nt										
Calcu	lated fo	r June, .	July and	August.	See Tal	ole 10b							Ī	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		`	1		i e		perature				·	<u> </u>	I	
(100)m=	0	0	0	0	0	560.46	441.21	451.47	0	0	0	0		(100)

Utilisation factor for loss hm										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0	0.97	0.99	0.98	0	0	0	0		(101)
Useful loss, hmLm (Watts)	= (100)m x (101)r	 n		1	l					
(102)m = 0 0 0	0 0	541.89	435.58	442.2	0	0	0	0		(102)
Gains (solar gains calculated for applicable weather region, see Table 10)										
(103)m= 0 0 0	0 0	792.43	755.27	703.18	0	0	0	0	(44)	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103) m – (102) m] x (41) m set (104) m to zero if (104) m < 3 \times (98) m										
(104)m = 0 0 0	0 0	180.39	237.85	194.17	0	0	0	0		
	612.41	(104)								
Cooled fraction)L)				f C =	cooled	area ÷ (4	4) =	0.68	(105)
Intermittency factor (Table 10 (106)m= 0 0 0	0 0	0.25	0.25	0.25	0	0	0	0		
(100)111-		0.20	0.20	0.20		l = Sum(= +	0	(106)
Space cooling requirement for	or month = (104) r	n × (105)	× (106)r	m						`` ′
(107)m = 0 0 0	0 0	30.68	40.45	33.02	0	0	0	0		_
					Tota	= Sum((1,0,7)	= [104.15	(107)
Space cooling requirement in	n kWh/m²/year				(107)) ÷ (4) =			1.47	(108)
9b. Energy requirements – C										
This part is used for space h Fraction of space heat from s							unity scl	neme.	0	(301)
Fraction of space heat from	community syster	n 1 – (301	1) =						1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter										_
includes boilers, heat pumps, geother Fraction of heat from Commo		from power	r stations.	See Appe	ndix C.			Г	4	(303a)
						(0	20) (200	L 	1	╡
Fraction of total space heat f							02) x (303	ia) =	1	(304a)
Factor for control and chargi	ng method (Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution loss factor (Table	e 12c) for commu	nity heatir	ng syste	m					1.05	(306)
Space heating								_	kWh/year	
Annual space heating require	ement								1871.21	
Space heat from Community	heat pump				(98) x (30	04a) x (30	5) x (306)	=	1964.77	(307a)
Efficiency of secondary/supp	lementary heating	g system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating requirement f	om secondary/su	ıpplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating								Г		_
Annual water heating require									1923.11	
If DHW from community sche Water heat from Community					(64) x (30	03a) x (30	5) x (306)	=	2019.26	(310a)
Electricity used for heat distr	bution			0.01	× [(307a)	(307e) +	(310e)] =	39.84	(313)	
Cooling System Energy Effic	iency Ratio							Ī	6.25	(314)
Space cooling (if there is a fi	ked cooling syste	m, if not e	enter 0)		= (107) ÷	(314) =		Ī	16.66	(315)
Electricity for pumps and fans within dwelling (Table 4f):										_
mechanical ventilation - bala	nced, extract or p	ositive in	put from	outside					173.24	(330a)

warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	173.24	(331)
Energy for lighting (calculated in Appendix L)	314.29	(332)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =	4488.23	(338)
12b. CO2 Emissions – Community heating scheme		
Energy Emission facto		
kWh/year kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water heating (not CHP)		
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second for	uel 364	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52	= 568.05	(367)
Electrical energy for heat distribution [(313) x 0.52	= 20.68	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)	= 588.73	(373)
CO2 associated with space heating (secondary) (309) x 0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x 0.52	= 0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =	588.73	(376)
CO2 associated with space cooling (315) x	= 8.65	(377)
CO2 associated with electricity for pumps and fans within dwelling (331) x 0.52	= 89.91	(378)
CO2 associated with electricity for lighting (332))) x 0.52	= 163.12	(379)
Total CO2, kg/year sum of (376)(382) =	850.41	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	11.98	(384)
El rating (section 14)	90.18	(385)